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AIRPORT RATING REGULATIONS

Effective as amended January 1, 1929

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AIRPORT RATING REGULATIONS

[Effective as amended January 1, 1929]

LAW

"The Secretary of Commerce shall by regulation * * * provide for the examination and rating of air-navigation facilities available for the use of aircraft of the United States as to their suitability for such use. (Sec. 3 (d), air commerce act of 1926.)

"The term 'air-navigation facility' includes any airport, emergency landing field, light or other signal structure, radio directional finding facility, radio or other electrical communication facility, and any other structure or facility used as an aid to air navigation. (Sec. 9 (i).)

"The term 'airport' means any locality either of water or land which is adapted for the landing and taking off of aircraft and which provides facilities for shelter, supply, and repair of aircraft, or a place used regularly for receiving or discharging passengers or cargo by air." (Sec. 9 (g).)

DEFINITIONS

LANDING STRIP.—A landing strip is an area at least 500 feet wide which forms part of an airport, intermediate or auxiliary field, and which is suitable by natural condition or artificial construction for the landing and taking off of airplanes.

RUNWAY.—An artificial landing strip or portion thereof at least 100 feet wide. When the natural condition of the ground is unsuitable for regular operation of airplanes, artificial preparation is necessary, using crushed stone, crushed slag, or other wear-resisting material in conjunction with a suitable binder, in order to present a satisfactory surface under all ordinary weather conditions. The artificial runway may be laid down upon a landing strip, but it need not cover the entire area of the landing strip.

Part I.—GENERAL PROCEDURE, PENALTIES, AND WAIVER OF REGULATIONS

GENERAL PROCEDURE

SECTION 1. The Secretary of Commerce will rate airports of the United States as to their suitability upon application of the owners of these facilities. Such application shall be made in duplicate on the form provided by the Department of Commerce.

The owners of all such airports found suitable for use by aircraft of the United States after due investigation by the Secretary of Commerce will be issued a rating certificate which will identify such

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facilities as hereinafter provided. Such certificates will be issued for an indefinite period unless specifically revoked. Annual reports covering the condition of the facilities and describing any material change shall be rendered in duplicate to the Secretary of Commerce at such time as he may designate and on the form provided by the Department of Commerce.

Major changes on rated airports shall not be made without approval of the Secretary of Commerce. Any such change will automatically cancel the certificate unless such change has the prior approval of the Secretary of Commerce. The decision of the Secretary of Commerce as to what constitutes a major change shall be final.

As used in these regulations, the words "Secretary of Commerce" shall be interpreted to include the duly authorized representative of the Secretary of Commerce, and the acts of such representative shall have the same force and effect as though performed by the Secretary in person.

The airport ratings will be based on the requirements hereinafter set forth and will be indicated in each case by a letter, a figure, and a letter. The first letter will indicate the general equipment and facilities at the airport; the figure will indicate the effective landing area; and the second letter will indicate the night lighting equipment. The order will be letter, figure, letter, as "A 1 A," which is the highest rating given.

After an airport has been rated as herein provided, it shall be so operated and maintained at all times as to meet at least the requirements of these regulations for the particular rating issued; otherwise, after due investigation, either the rating certificate will be recalled and a new certificate issued for a lower rating based on conditions existing at the airport or the rating will be revoked, as, in the opinion of the Secretary of Commerce, the circumstances of the case may justify.

When ratings are revoked, the rating certificate shall be returned immediately to the Secretary of Commerce.

In case improvements are made in a rated airport which bring it up to the requirements of these regulations for a higher rating, the Secretary of Commerce will, upon application from the owner of the airport and after due investigation, recall the rating certificate previously issued and issue a new certificate for said higher rating. Such application shall be made in duplicate upon the form provided by the Department of Commerce.

PENALTIES

SEC. 2. Any person who fraudulently forges, counterfeits, alters, or falsely makes any certificate authorized to be issued under the act, or knowingly uses or attempts to use any such fraudulent certificate, shall be guilty of an offense punishable by a fine not exceeding $1,000, or by imprisonment not exceeding three years, or by both such fine and imprisonment.

Any person (1) who, with intent to interfere with air navigation in the navigable air space or waters of the United States, exhibits within the United States any false light or signal at such place or in such manner that it is likely to be mistaken for a true light or signal required by regulations under this act, or for a true light or signal in

connection with an airport or other air navigation facility, or (2) who, after due warning from the Secretary of Commerce, continues to maintain any false light or signal, or (3) who knowingly removes, extinguishes, or interferes with the operation of any such true light or signal, or (4) who, without lawful authority, knowingly exhibits any such true light or signal, shall be guilty of an offense punishable by a fine not exceeding $5,000, or by imprisonment not exceeding five years, or by both such fine and imprisonment.

WAIVER OF REGULATIONS

SEC. 3. The Secretary of Commerce may waive any of the requirements of these regulations when, in his discretion, the particular facts justify such waiver. The letter or figure covering the part of the rating under which requirements have been waived will be underscored. For instance, an airport bearing the rating "A 1 A" will not have fully met the requirements for a "1" rating on size of effective landing area, but will have been granted this rating because of some special condition impossible of change and which is believed by the Secretary of Commerce to be fully compensated by other conditions.

Part II.—RATING OF AIRPORTS FOR LANDPLANES

BASIC REQUIREMENTS

SEC. 4. The minimum basic requirements for the rating of airports are as follows:

(*a*) *Suitable landing area.*—The airport shall afford a firm, smooth, well-drained landing area, approximately level, without obstructions or depressions presenting hazards in taking off or landing, and with suitable approaches. If sufficient area is not available for landing and taking off in all directions, there shall be at least two landing strips 500 feet or more in width crossing or converging at an angle of not less than 60°. The landing area shall permit safe landing and taking off under all ordinary weather conditions. If the surface of the landing area is not sufficiently firm and well drained for this purpose, runways shall be constructed as hereinafter specified. Roads shall not cross any part of the landing area, whether open field or landing strips, and stock and unauthorized persons and vehicles shall not be allowed on the landing area, as this area must be kept clear and ready for use at all times. The maximum slope of the landing area shall at no point exceed 3 inches in 10 feet, which corresponds to a grade of 2½ per cent. The mean slope of the landing area shall not be more than 2 per cent in any direction.

(*b*) *Freedom from obstructions.*—For airports located at sea level, surrounding obstructions diminish the effective landing lengths for planes landing or taking off over these obstructions by amounts equal to seven times the height of the obstructions above the landing area, said distances being measured, in each case, horizontally from vertical lines passing through the critical points of the obstacles. For instance, obstacles 50 feet high along the border of a field diminish

the effective landing length for planes landing or taking off over these obstacles by 350 feet. In the case of landing strips, the presence of obstacles in the approaches will likewise diminish the effective lengths of the landing strips. Where obstacles lie alongside the landing strips, so that planes landing pass parallel to and not over them, the obstacle rule of 7 to 1 will not apply, providing that no landing strip shall be less than 500 feet wide, in accordance with paragraph (*a*) of basic requirements. (However, the location of buildings or other obstructions in the V formed by landing strips or runways is subject to a number of objections. Furthermore, it is important that the entire area in the vicinity of the airport be as free from obstructions as possible.)

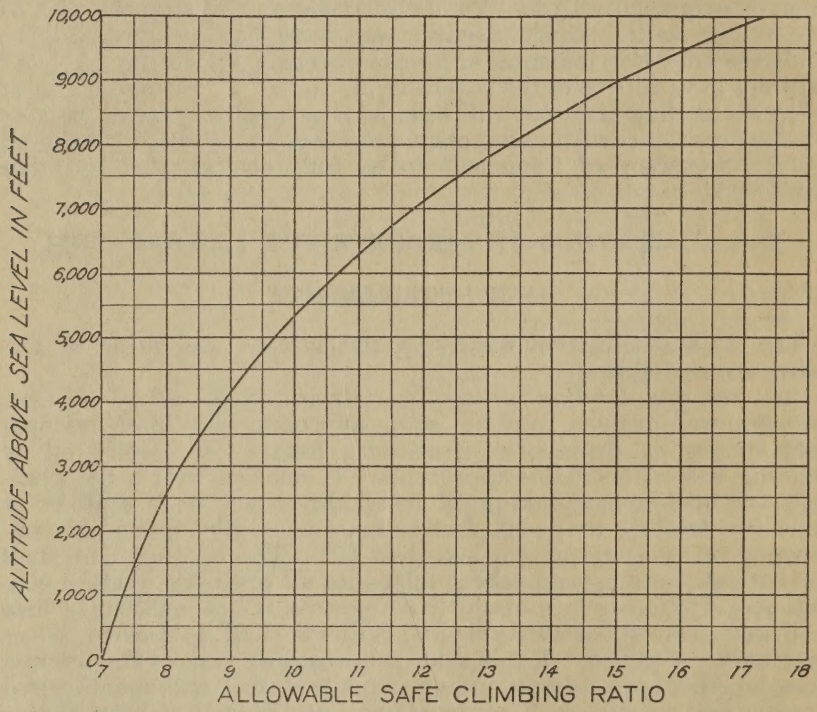


FIGURE 1.—Allowable safe climbing ratios for clearing obstructions at altitudes above sea level, based on a ratio of 7 to 1 at sea level

For airports located at altitudes in excess of 1,000 feet above sea level, the allowable safe climbing ratios for clearing obstructions shall be increased from the value of 7 to 1 used at sea level to the values shown in Figure 1. (At altitudes above sea level, airplanes land and take off at higher speeds and climb at flatter angles than at sea level.)

(*c*) *Accessibility.*—The airport shall be situated on a good road leading to the nearest city or town.

(*d*) *Wind-direction indicator.*—The airport shall be equipped with an approved type of wind-direction indicator, as hereinafter specified.

(*e*) *Markings.*—The landing area shall be marked by means of a circle at least 100 feet in diameter having a band 4 feet wide, constructed of crushed rock, gravel, or other suitable material. The circle shall be finished flush with the surrounding surface and unless constructed of a bright white material, shall be kept whitewashed or painted chrome yellow. In case the circle is constructed of concrete or other similar material, shoulders of some granular material, such as crushed stone or crushed slag, or other suitable means shall be provided on both the inside and outside of the circle in order to insure the safe landing and taxiing of planes across the circle in any direction.

The name of the city or town shall be placed near the marker circle (name should not be placed inside of circle) or on the roof of at least one airport building, or on other suitable area, in such manner as to be visible from an altitude of at least 2,000 feet. (Lettering should be from 10 to 30 feet in height as space may permit.) In no case shall the height of the lettering be less than 6 feet. In case the name of the city or town or any other marking is placed on the landing area, it shall be constructed and maintained in the manner hereinabove required for the marker circle.

(It is recommended that, wherever practicable, a combination of chrome yellow and dead black be used in air-marking roofs and other similar areas and that, particularly in cases where the markings are to be illuminated, the chrome yellow be used for the lettering and other symbols, and the dead black for the background.)

The outline of the usable portion of the landing area shall be marked by means of painted galvanized sheet-metal cones not less than 36 inches in diameter at the base by 24 inches in height, or solid 4-foot white or chrome yellow circles constructed of crushed stone, gravel, or other suitable material, or by means of other markers of equivalent effectiveness, placed not more than 300 feet apart and kept painted or whitewashed. In case the landing area is boundary lighted, the markers shall be constructed around the boundary lights. In case sheet-metal cones are used, they should be painted in accordance with the following standard system of marking: For either white or yellow lights, chrome yellow with an 8-inch horizontal dead black stripe 9 inches from the base of the cone. For green lights, eight equal segmental elements, alternating chrome yellow and dead black, each element covering a 45° segment of the surface. For red lights, light vermilion with an 8-inch horizontal white stripe 9 inches from the base of the cone. These figures are for cones measuring 36 inches in diameter at the base by 24 inches in height; if cones of larger dimensions are used the width of horizontal stripe and height of stripe above base of cone should be varied accordingly.

Any part of the landing area temporarily unsafe for landing, or which is not available for any cause, shall be clearly marked with red flags of sufficient size to draw attention readily and so placed as to show the boundaries of the danger area. In case the airport is lighted for night operation, the boundaries of such danger area shall be clearly marked throughout the hours of the night (from sunset until sunrise) either with red electric lights with weatherproof fittings or with red lanterns.

(*f*) *Runways.*—Runways shall be constructed of some wear-resisting material, such as crushed stone, crushed slag, or other suitable material, in such a manner as to give a smooth, firm, uniform surface. (This includes such types of construction as bituminous macadam, bituminous concrete, Portland cement concrete, etc.) Runways shall be so designed and constructed as to withstand safely the loads to which they will ordinarily be subjected. They shall permit safe landing and taking off under all ordinary weather conditions and shall be not less than 100 feet in width. The edges of the runways shall be flush with the adjacent surfaces of the field, and shoulders of some granular material, such as crushed stone or crushed slag, or other suitable means shall be provided in order to insure the safe landing and taxiing of planes across the runways in any direction.

(*g*) *Drainage.*—The landing area shall be adequately drained whether runways are used or whether the entire field is available for landing and taking off. If the natural drainage is sufficient, no artificial drainage system will be required.

(*h*) *Fuel, communication, transportation, and personnel.*—The airport shall be provided with facilities for supplying aircraft with fuel, oil, and water, also drinking water shall be available. If there are no rest rooms on the airport, a suitable latrine shall be provided. The airport shall have dependable communication and transportation facilities to the nearest city or town. Airport personnel shall be in attendance by day or available on call by telephone at the airport. In the latter case, a directory and full instructions for reaching such personnel shall be available in the telephone booth or receptacle.

RATING ON GENERAL EQUIPMENT AND FACILITIES

SEC. 5. "A" RATING.—In addition to the facilities named in the basic requirements, airports receiving an "A" rating on general equipment and facilities shall have the following:

(*a*) At least one hangar measuring not less than 80 by 100 feet in the clear inside with doors open, with 18-foot overhead clearance, with full-width door opening in either one or both ends or one or both sides, and with safe provision for heating water and oil. In localities where freezing temperatures are experienced the hangar shall be heated sufficiently to prevent freezing of water.

(*b*) One or more wind-direction indicators of an approved type, equivalent in effect to a wind cone not less than 12 feet long, 36 inches in diameter at the throat, 12 inches in diameter at the tail, constructed of open-weave unbleached yellow muslin, and so mounted as to fly freely with the wind. This wind-direction indicator shall be so located as to give a true indication of the direction of the wind on the landing area and as to be readily visible to aircraft approaching the airport from any direction. In case it is not visible to aircraft approaching from any direction, such additional wind-direction indicators shall be installed as may be necessary.

(*c*) All telephone and transmission line poles, radio towers and masts, transmission towers, flagpoles, and similar obstructions in the immediate vicinity of the airport shall be day-marked by painting with alternate bands of either chrome yellow and dead

black, or white and dead black, terminating with either a chrome yellow or a white band at the top, depending on the color combination used. The width of the bands shall be one-fifth of the height of the structure for all structures less than 250 feet high, and for structures over 250 feet high the bands shall be 50 feet wide. Such structures as chimneys and water towers in the immediate vicinity of the airport are not required to be painted in this manner unless, in the opinion of the Secretary of Commerce, such painting is necessary from the standpoint of safety.

The posts of landing area fencing shall be painted either chrome yellow or white.

(*d*) Repair equipment sufficient to permit changing of engines and landing gear and equipment for major engine and plane repairs.

(*e*) Weather instruments, including an anemometer, barometer, and thermometer. There shall also be a bulletin board and facilities for giving pilots the most recent weather information.

(*f*) Radio-receiving set and loud-speaker, under certain conditions, as follows: Airports located within a radius of 400 miles of Department of Commerce airways radio stations shall be equipped with suitable radio-receiving sets with loud-speakers, in order that those using the airport may avail themselves of the hourly weather reports broadcast from said stations. As additional airways radio stations are installed by the Department of Commerce, airports located within a radius of 400 miles of such stations and previously granted an "A" rating on general equipment and facilities shall provide themselves with suitable radio-receiving sets and loud-speakers in order to retain this rating.

(*g*) Adequate equipment for removing snow from landing areas or landing strips or equipment for packing snow sufficiently to permit safe landing and taking off of aircraft. (This equipment will not be required at airports where snowfall is never sufficient to cause difficulty in operation.)

(*h*) First-aid equipment consisting of an ambulance, or some vehicle which can be used as an ambulance, equipped with the following: First-aid kit, drinking water, crowbar, wire cutters, hack saw, ax, cloth-cutting shears, fire extinguisher, two litters.

The first-aid kit shall contain at least 12 assorted bandages, 12 sterile dressings, 2 tourniquets, a supply of first-aid dressings for burns, adhesive tape, a supply of either tincture of iodine or mercurochrome, aromatic spirits of ammonia, and a paper or glass cup.

The litters should preferably be of the Stokes Navy type. If they are of the ordinary type, then the vehicle shall also carry an assortment of splints.

(*i*) A register of arriving and departing aircraft to include the following information:

(1) License number and model of arriving or departing plane.
(2) Owner of plane.
(3) Pilot of plane and his license number.
(4) Time of arrival and departure.
(5) Number of crew.
(6) Number of passengers.
(7) Space for remarks covering any unusual situation.

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(*j*) *Adequate fire-fighting equipment.*—As this depends on the size and number of buildings, spacing of structures, type of construction, etc., no definite rule can be made which will apply to each case, but such rating will depend upon recommendation of the department representatives, who will be guided in a large meaure by the standards of the National Board of Fire Underwriters.

(*k*) Sufficient personnel in attendance throughout the day to give proper operation of the airport, including servicing aircraft, making major repairs, giving weather service, and operating the fire-fighting equipment.

(*l*) Sleeping quarters for at least three men, in addition to the field personnel, at the airport or not more than one-half mile distant.

(*m*) Waiting and rest rooms on the field.

(*n*) A restaurant or other public source of food supply. (If not actually on the airport, this shall be not more than one-half mile distant.)

"B" RATING.—In addition to the facilities named in the basic requirements, airports receiving a "B" rating on general equipment shall have the following:

(*a*) At least one hangar measuring not less than 60 by 80 feet in the clear inside with doors open, with 14-foot overhead clearance, with full-width door opening in either one or both ends or one or both sides, and with provisions for heating water and oil as required for an "A" rating.

(*b*) Wind-direction indicator, day marking of obstructions, weather instruments, adequate equipment for removing snow, first-aid equipment, fire-fighting equipment, and a register, all as required for an "A" rating.

(*c*) Repair equipment sufficient to permit changing of engines and landing gear and equipment for minor engine and plane repairs.

(*d*) Sufficient personnel in attendance throughout the day to give proper operation of the airport, including servicing aircraft, making minor repairs, giving weather service, and operating the fire-fighting equipment.

(*e*) Sleeing quarters for at least two men, in addition to the field personnel, at the airport or not more than one-half mile distant.

(*f*) Rest room.

"C" RATING.—In addition to the facilities named in the basic requirements, airports receiving a "C" rating on general equipment shall have the following:

(*a*) At least one hangar measuring not less than 50 by 60 feet in the clear inside with doors open, with 12-foot overhead clearance, with full-width door opening in either one or both ends or one or both sides, and with means for heating water and oil as required for an "A" rating.

(*b*) One or more wind-direction indicators as required for an "A" rating, except that wind cone shall be not less than 9 feet long, 24 inches in diameter at the throat, and 10 inches in diameter at the tail.

(*c*) First-aid equipment, fire-fighting equipment, and a register as required for an "A" rating. (The day marking of telephone and transmission line poles and similar obstructions in the immediate vicinity of the airport as required for the "A" and "B" ratings is

not required for either the "C" or "D" ratings but is most urgently recommended.)

(*d*) Rest room.

"D" RATING.—Fields which do not possess sufficient general equipment to obtain A, B, or C ratings, but which meet the basic requirements, will receive a rating of "D" on general equipment.

RATING ON SIZE OF EFFECTIVE LANDING AREA

SEC. 6. "1" RATING.—In addition to the basic requirements, an airport receiving a "1" rating on size of effective landing area shall have at least 2,500 feet of effective landing area in all directions, with clear approaches, and the field shall be in good condition for landing at all times; or it shall have landing strips not less than 500 feet wide, permitting landing in at least eight directions at all times, the landing strips not to cross or converge at angles of less than 40°, nor any one of the landing strips to be less than 2,500 feet in effective length, with clear approaches.

By clear approaches is meant absence of buildings, towers, and other obstacles over which a 7 to 1 glide or climb to or from the edge of the landing area would not be possible, and absence of smokestacks, towers, high-tension power lines, etc., which constitute obstructions even though beyond the 7 to 1 ratio. (See sec. 4 (*b*) for increase in allowable safe climbing ratio for altitudes in excess of 1,000 feet above sea level.)

When the airport lies at an altitude in excess of 1,000 feet above sea level, the dimensions of the effective landing area or the effective lengths of the landing strips shall be increased to the corresponding values shown in Figure 2.

"2" RATING.—In addition to the basic requirements, an airport receiving a "2" rating on size of effective landing area shall have at least 2,000 feet of effective landing area in all directions, with clear approaches, and the field shall be in good condition for landing at all times; or it shall have landing strips not less than 500 feet wide, permitting landing in at least eight directions at all times, the landing strips not to cross or converge at angles less than 40° nor any one of the landing strips to be less than 2,000 feet in effective length, with clear approaches; or it shall have two landing strips, one aligned with the general direction of the prevailing wind, permitting at least four-way landing at all times and having clear approaches, the landing strips to be at least 500 feet wide and not less than 3,000 feet in effective length and not to cross or converge at an angle of less than 60°.

The dimensions of the effective landing area and the effective lengths of the landing strips shall be increased at altitudes above 1,000 feet to the corresponding values shown in Figures 2 and 3.

"3" RATING.—In addition to the basic requirements, an airport receiving a "3" rating on size of effective landing area shall have at least 1,600 feet of effective landing area in all directions, with clear approaches, and the field shall be in good condition for landing at all times; or it shall have landing strips not less than 500 feet wide, permitting landing in at least eight directions at all times, the

landing strips not to cross or converge at angles less than 40° nor any one of the landing strips to be less than 1,600 feet in effective length, with clear approaches; or it shall have two landing strips, one aligned with the general direction of the prevailing wind, permitting at least four-way landing at all times and having clear approaches, the landing strips to be at least 500 feet wide and not

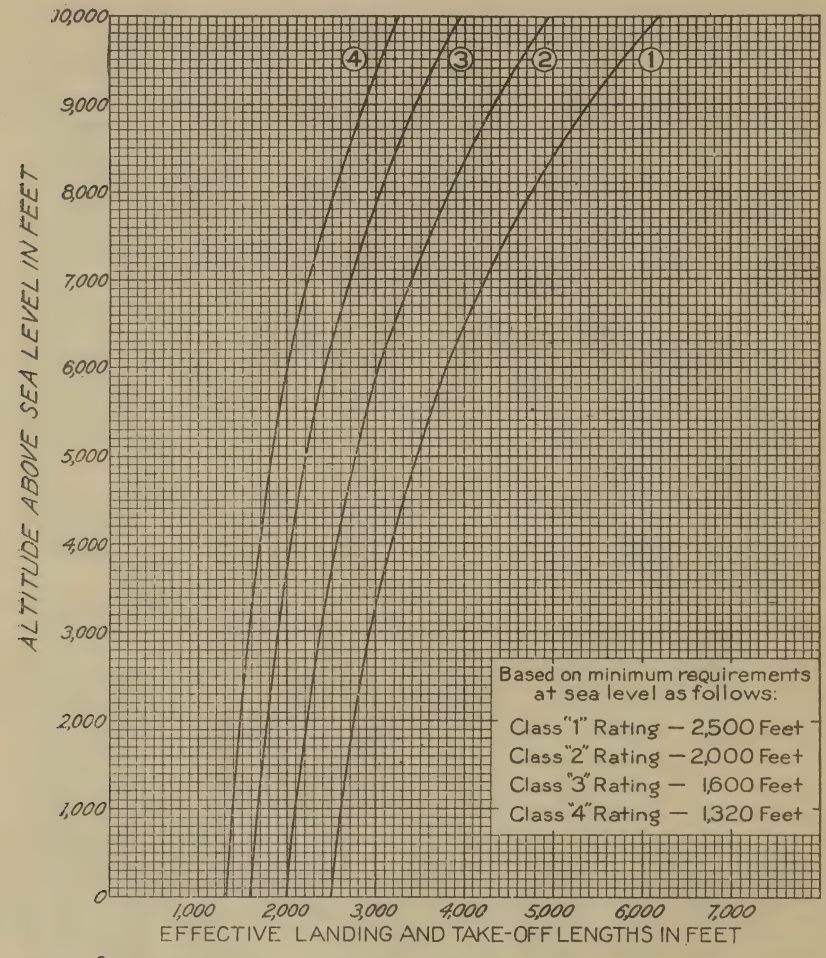


FIGURE 2.—Required effective landing and take-off lengths for all-way and light-way landing areas at altitudes in excess of 1,000 feet above sea level

less than 2,500 feet in effective length and not to cross or converge at an angle of less than 60°.

The dimensions of the effective landing area and the effective lengths of landing strips shall be increased at altitudes above 1,000 feet to the corresponding values shown in Figures 2 and 3.

"4" RATING.—In addition to the basic requirements, an airport receiving a "4" rating on size of effective landing area shall have at least 1,320 feet of effective landing area in all directions, with

clear approaches, and the field shall be in good condition for landing at all times; or it shall have landing strips not less than 500 feet wide, permitting landing in at least eight directions at all times, the landing strips not to cross or converge at angles less than 40° nor any one of the landing strips to be less than 1,320 feet in effective length, with clear approaches; or it shall have two landing strips,

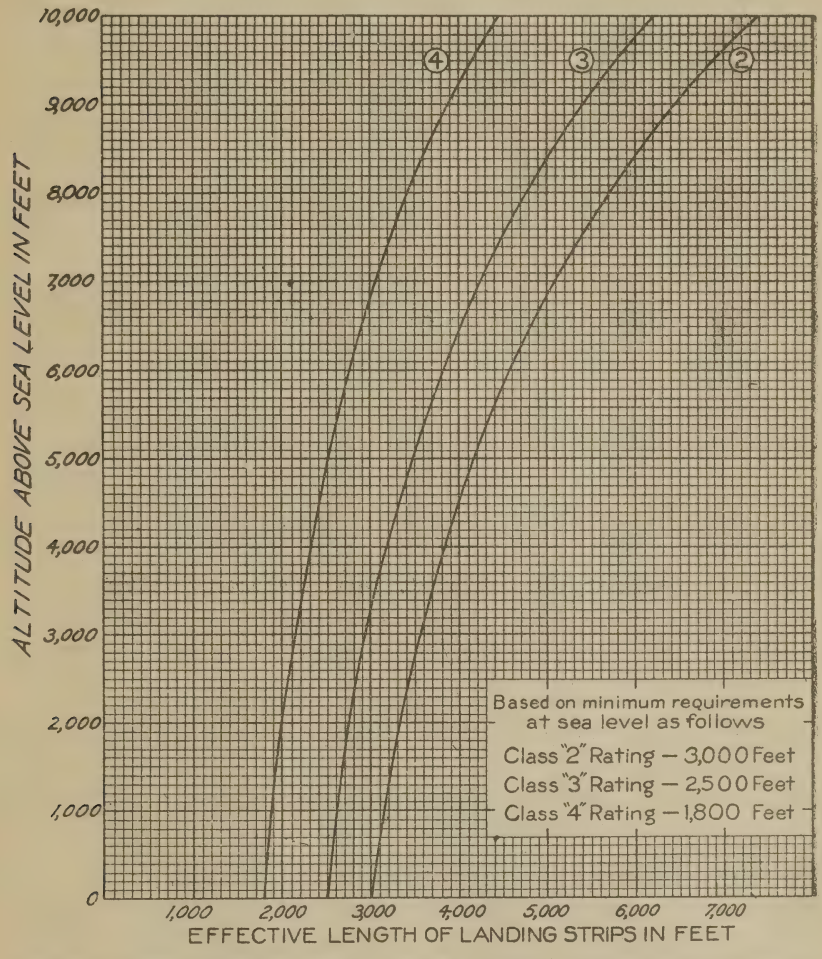


FIGURE 3.—Required effective length of landing strips for four-way landing areas at altitudes in excess of 1,000 feet above sea level

one aligned with the general direction of the prevailing wind, permitting at least four-way landing at all times and having clear approaches, the landing strips to be at least 500 feet wide and not less than 1,800 feet in effective length and not to cross or converge at an angle of less than 60°.

The dimensions of the effective landing area and the effective lengths of the landing strips shall be increased at altitudes above 1,000 feet to the corresponding values shown in Figures 2 and 3.

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"5" RATING.—Airports not having landing areas meeting the minimum requirements for a "4" rating as to size but which request rating, and which the Secretary of Commerce considers safe for the use to which they are being put, shall receive the rating of "5" on size of landing area.

"0" RATING.—An airport which, in the opinion of the Secretary of Commerce, is unsafe for operation, but from which operations are nevertheless taking place and which requests a rating, will be rated "0" on size of effective landing area.

RATING ON NIGHT LIGHTING EQUIPMENT

SEC. 7. "A" RATING.—Airports receiving an "A" rating on night lighting equipment shall have the following:

(*a*) *An airport beacon.*—The requirements for a satisfactory aeronautical beacon light for airports are adequate candlepower, not less than 100,000 for long range; proper distribution of light in the vertical plane to make the beacon visible all around the horizon and to the zenith, or nearly so, for altitudes of from 500 to 2,000 feet; distinctiveness for identification; flashes of not less than one-tenth second duration; luminous period of not less than 10 per cent; and eclipse periods of not more than 10 seconds duration.

Apparatus having characteristics other than above specified but of equivalent effectiveness, owing to greater luminous periods and shorter eclipse periods, greater candlepower, or color effect, may be used. In no case, however, shall the beam candlepower be less than 15,000 nor shall the luminous period be greater than 60 per cent. For beacons of 30,000 candlepower or less the luminous period shall be at least 35 per cent. Beacons of less than 20,000 candlepower shall have a distinctive color characteristic. All flashing beacons shall have a definite Morse code characteristic and shall be operated by flashing mechanisms so designed as not to interfere with radio reception.

The beacon may have fixed lenses, or a combination of lenses, with a flashing light source; flash panel lenses; neon lights, with or without optical apparatus, to the equivalent specified above; or it may be a rotating searchlight beacon, making six revolutions per minute, with at least one parabolic mirror or other equivalent optical apparatus, with a horizontal beam divergence of from 4 degrees with at least 6,750,000 beam candlepower to 6 degrees or more with at least 1,750,000 beam candlepower. In the case of beacons having a single light source an automatic lamp changer for bringing a spare lamp into the focal position shall be provided or else there shall be an auxiliary beacon of at least 10,000 candlepower which is either kept in operation with the major unit or so designed as to be turned on automatically without interruption of service.

Wherever practicable the airport beacon shall be installed directly on the airport or immediately adjacent thereto and in such manner as to be visible in all directions. In case the topography of the surrounding terrain is such as to necessitate installing the beacon at some distance from the airport, there shall be installed on the airport a green, flashing, double light source, auxiliary beacon of not less than 5,000 candlepower and with a definite Morse code character-

istic, or in lieu thereof a white, flashing, double light source, auxiliary beacon of not less than 10,000 candlepower and with a definite Morse code characteristic. In no case, however, shall the distance from the main beacon to the nearest edge of the landing area of the airport exceed 1 mile.

(On the national airway system, flashing, red, course-lights are used at beacons where no landing fields are located, and flashing, yellow, course lights are used at beacons where intermediate fields have been established. It is urgently recommended that green, flashing, double light source, auxiliary beacons of at least 5,000 candlepower and with definite Morse code characteristics and of such type as to be visible all around the horizon and to the zenith be installed on the airports in addition to the major airport beacons. It is suggested that, where practicable, the auxiliary beacons be installed directly above the major beacons. The uniform use of red, yellow, and green auxiliary beacons to indicate landing conditions would add materially to the safety of night flying.)

(*b*) *An illuminated wind-direction indicator.*—There shall be at least one illuminated wind-direction indicator, internally or externally lighted, equivalent in effect to the wind cone described under the requirements for an "A" rating on general equipment and facilities. A lamp of not less than 200 watts with suitable reflector will be required for the internal lighting of this wind cone. For external lighting, a suitable system of reflectors with at least four 100-watt lamps, or the equivalent, shall be so mounted above the wind cone as to make it readily visible in every direction.

(*c*) *Boundary lights.*—The outline of the usable portion of the landing area shall be shown at night by boundary lights spaced not more than 300 feet apart and served by an underground distribution system. Either series or multiple circuits may be used.

The cable used for boundary light circuits shall be rubber-insulated underground cable, with either metallic or moisture resisting non-metallic sheathing and with jute or other suitable fiber serving, and shall be insulated for at least the maximum open-circuit voltage obtainable on the circuit. The cable conductors shall be of copper, and for multiple circuits they shall be of such size that the voltage drop will not exceed 5 per cent of the normal operating voltage of the circuit, but in the case of neither series nor multiple circuits shall they be less than No. 8 B. and S. gauge. In the case of multiple circuits using either a 3-wire closed ring circuit or a straight 3-wire circuit, No. 10 B. and S. gauge bare copper wire may be used for the third conductor. Such cable and wire shall be installed at a depth of at least 10 inches unless otherwise protected by suitable mechanical means. (In laying the cable it should be unreeled in place along the trench and not pulled in.)

For series circuits having normal operating voltages in excess of 310 volts, a series transformer (safety coil) shall be installed at the base of each boundary light standard to prevent accident through high-tension current in event of collision with the light. In the case of series circuits with operating voltages of 310 or less the use of such series transformers is not required, providing the maximum open-circuit voltage does not exceed 450 volts. A series circuit using two constant-current transformers with the secondary windings of these transformers connected in series and with both the point of connec-

tion between these two secondary windings and a suitable point in the circuit effectively grounded, or other equivalent installation, may be used without the series transformers (safety coils) providing the operating voltage and the maximum open-circuit voltage at any part of the circuit do not exceed 310 and 450 volts, respectively. (A grounded circuit should not be installed without first finding whether it is in keeping with the practice of the power company supplying the current.)

Suitable weatherproof units with either plain or prismatic globes are required for the boundary lights. On all series circuits these units shall be provided with cut-out sockets. In event of lamp failure such sockets are necessary to reestablish the circuit in the case of straight series circuits and in the case of series circuits with series transformers (safety coils), to short-circuit the series transformer secondary. (An open-circuited secondary sets up electromagnetic waves of such a frequency as to interfere with radio reception in the immediate vicinity.)

Either white or yellow lights shall be used in the boundary light system, excepting as follows: Where the entire field is not available for landing in all directions at all times, green lights shall be so placed in the system as to indicate clearly the ranges of each landing strip or runway. Red lights shall be installed in the boundary system at points where an approach is particularly hazardous.

In multiple circuits, at least 25-watt lamps shall be used for white and yellow lights and at least 50-watt lamps for green and red lights. In the case of series circuits, S–24½, 6.6-ampere, 600-lumen lamps shall be used for white and yellow lights, and 1,000-lumen lamps for green and red lights. Diffusing globes or frosted lamps shall be used for all white lights to prevent glare.

Obstruction lights marking pole lines or similar obstructions adjacent to the landing area will not be accepted in lieu of boundary lights. (In making night landings many pilots rely on the boundary lights to a certain extent to indicate the plane of the landing area, hence it is important that boundary lights be set comparatively low. Also, the low boundary lights are of material assistance in preventing collision with fences and other obstacles when planes are taxiing near the edge of the landing area.)

(*d*) *Obstruction lights.*—All obstructions on and in the vicinity of the airport shall be clearly marked with red lights of the same wattage or lumen output as the red lights specified for the boundary circuit. Suitable weatherproof units shall be used and shall be mounted in each case above the highest point of the obstruction or on poles of corresponding height placed alongside thereof. The use of a flashing mechanism in connection with the obstruction lights is not required or recommended; however, if such a mechanism is used, it shall be so designed as not to interfere with radio reception in the vicinity.

In marking a pole line, an obstruction light shall be placed on each pole along the airport and on at least three poles beyond the airport in each direction. In case there is more than one pole line along the same side of the airport, the obstruction lights shall be placed on the poles of the highest line. (While not required by these regulations, it is very desirable from the standpoint of safety that

two obstruction lights be placed on end poles and on corner poles; otherwise the burning out of the single light in such locations may lead to serious results.) The lights marking such obstructions as a row of trees shall not be spaced more than 300 feet apart.

All tall isolated obstructions in the vicinity of the airport exceeding 100 feet in height, such as radio towers and masts, flagpoles, transmission towers, water towers, chimneys, and other tall structures, shall be marked with at least two red lights placed directly above the obstruction, and with one red light, or more, as may be necessary to give visibility in all directions, placed at two-thirds the height and also at one-third the height of the obstruction. In lieu of such red obstruction lights, chimneys, water towers, and similar structures may be marked by adequate floodlighting.

(*e*) *Hangar flood lights and roof marking.*—The exterior surface of each hangar on the airport shall be flood lighted to an average intensity of illumination of at least 2½ foot candles. This may be accomplished by a system of at least 200-watt lamps with industrial reflectors mounted about 10 feet above the surface and spaced on 20-foot centers in each direction on the roof and along the eaves and ends of the roof, or by the use of flood-light projectors giving this specified intensity of illumination. Such projectors shall be so installed as not to produce a glare that will interfere with planes using the airport. The hangar flood-lighting equipment shall be lighted at times when night landings are being made.

The exterior surfaces of the hangars, excepting roof areas used as the background for air markings, shall be of such a color as to reflect not less than 50 per cent of the light, and at least one hangar roof, or other suitable area, shall be marked with the name of the city or town in the manner set forth in section 4 (*e*). Said marking shall be so illuminated as to be legible from an altitude of at least 2,000 feet. (In case the marking is illuminated by exposed incandescent lamps or by neon tubes, the lamps or tubes should preferably be placed along the center line of the strokes of the lettering and other symbols, and the roof should not be flood lighted. For outlining with incandescent lamps not less than 10-watt sign lamps should be used, and they should be spaced from 8 inches apart for 6-foot letters to 12 inches apart for 12-foot letters or larger. Neon tubes should be either 11 or 15 millimeter by either 18 or 25 milliampere red neon tubing. If the illumination of the marking is by flood lighting, either industrial reflectors or flood-light projectors may be used, and the intensity of illumination should be at least 10 foot candles and preferably 15 foot candles.)

(*f*) *A ceiling projector.*—For use as a ceiling projector there is required an incandescent searchlight with a parabolic reflector of not less than 12 inches in diameter and with at least a 250-watt lamp of the concentrated filament type used for spotlight or headlight service and a stray light shield giving a beam spread of not to exceed 7 degrees (preferably not more than 5 degrees), or an equivalent apparatus. (Projectors limited to these minimum requirements will not necessarily be large enough to handle the needs of every airport. In some cases, depending upon local conditions, it may be necessary to use units up to 24 inches in diameter and with 1,000-watt lamps.) The ceiling projector shall be mounted

on a yoke with a quadrant or other suitable means for elevating and holding the light at the proper angle. In case the projector is used in such a manner as to necessitate the measuring of verticle angles, an inclinometer, transit, or theodolite shall be provided, or in lieu thereof an alidade so graduated and installed as to give direct readings of the ceiling height.

(*g*) *Landing area flood-light system.*—This system, which may consist of one or more units, shall be such as to provide an even distribution of illumination (free from abrupt changes in intensity and from shadow areas) over the entire usable portion of the landing area. There shall be sufficient intensity of illumination to reveal the details of the surface and make depth perception readily possible from a minimum altitude of 30 feet in the center of the lighted area. The minimum vertical plane intensity of illumination over the usable portion of the landing area shall not be less than 0.15 foot candle.

The flood-light system shall be immediately available for use through the operation of control located at convenient point and shall be sufficiently elaborate or flexible to permit landing under all conditions of wind direction without the necessity of landing directly toward the light source.

There shall be sufficient light to illuminate objects and obstacles in the immediate vicinity of the airport in the direction of the beam, and the flood-light unit or units shall be so designed and installed as to eliminate glare and blinding of the pilot.

Units shall be mounted as low as possible consistent with the contour of the landing area, shall project a beam of small vertical divergence with sharp cut-off at the top and with top of beam as nearly parallel with and as close to the surface of the landing area as practicable. Units using more than one lamp shall be so constructed that the failure of one or more lamps will not interrupt the service of remaining lamps. When more than one unit is used, each unit shall be separately fused or other suitable provision shall be made to prevent a short circuit in one unit from interrupting service of other units. In lighting areas of irregular, wavy contour, the units shall be so placed as to eliminate shadows.

Where the flood lighting is accomplished from a single light source, an automatic lamp changer shall be provided to bring a new lamp into the focal position in case of lamp failure. This lamp changer shall be so designed that the reserve lamp is ready to be placed immediately on the line. In lieu of a lamp changer an auxiliary unit may be provided which will give sufficient light for safe landing of aircraft should the major unit fail, and which will produce a minimum vertical plane intensity of illumination of not less than 0.035 foot candle over the usable portion of the landing area. This auxiliary unit, if not in operation with the major unit, shall be so designed as to be turned on automatically without interruption of service, and shall be located at or near the major unit in order to avoid confusion of the pilot due to sudden and unexpected change of location of the light source. In event said single light source is a high-intensity arc, neither an automatic lamp changer nor an auxiliary unit is required, providing the flood-light unit is at all times operated under the care of a competent attendant to

see that carbons of sufficient length are in place each time the light is turned on and that the arc is kept functioning properly.

In case the landing area exceeds the size required for a class "1" rating at the altitude in question, the area to be flood lighted in the manner hereinabove specified shall at least meet the size requirements for a class "1" rating, but need not exceed them. It is highly desirable, however, that the entire landing area be lighted.

(*h*) *All-night operation of lighting equipment.*—The airport beacon, wind-direction indicator lights, boundary lights, obstruction lights, and roof marking lights shall be kept burning all night (from sunset until sunrise) every night. (It is preferable that this equipment be kept burning from one-half hour before sunset until one-half hour after sunrise.)

(*i*) *Night personnel.*—Sufficient personnel shall be in attendance throughout the night for proper operation of the lighting equipment, for servicing aircraft, making minor repairs, and giving weather service, and for operating the fire-fighting equipment.

"B" RATING.—Airports receiving a "B" rating on night-lighting equipment shall have the following:

(*a*) An airport beacon as required for an "A" rating.

(*b*) An illuminated wind-direction indicator as required for an "A" rating.

(*c*) Boundary lights as required for an "A" rating.

(*d*) Obstruction lights as required for an "A" rating.

(*e*) The exterior surface of one hangar flood lighted and the name of the city or town marked on a hangar roof or other suitable area, and illuminated, all in the manner required for an "A" rating.

(*f*) A ceiling projector as required for an "A" rating.

(*g*) A landing area flood-light system, portable or otherwise, which will provide suitable illumination for safe landing of airplanes under ordinary conditions and which will give a minimum vertical plane intensity of illumination over the usable portion of the landing area, or a portion thereof equivalent to the area required for a "1" rating on size, of at least 0.035 foot-candle.

(*h*) All-night operation of lighting equipment as required for an "A" rating.

(*i*) Sufficient personnel in attendance throughout the night for proper operation of the lighting equipment, servicing aircraft, giving weather service, and operating fire-fighting equipment.

"C" RATING.—Airports receiving a "C" rating on night lighting equipment shall have the following:

(*a*) An airport beacon as required for an "A" rating.

(*b*) An illuminated wind-direction indicator as required for an "A" rating, except that said wind-direction indicator shall be equivalent in effect to at least the wind-direction indicator required for a "C" rating on general equipment and facilities.

(*c*) Boundary lights as required for an "A" rating.

(*d*) Obstruction lights as required for an "A" rating.

(*e*) A ceiling projector as required for an "A" rating.

(*f*) The name of the city or town marked on a hangar roof or other suitable area, and illuminated, as required for an "A" rating.

(*g*) All-night operation of lighting equipment as required for an "A" rating.

(*h*) Attendance available on request.

"D" RATING.—Airports not possessing sufficient night-lighting equipment to receive a "C" rating but which possess an airport beacon and boundary-light system, together with an illuminated wind-direction indicator and adequate obstruction lights, will be given a rating of "D," providing all such lighting equipment is kept burning all night every night.

"E" RATING.—Airports having the necessary night-lighting equipment to meet the requirements of any of the above ratings and which keep this equipment available for operation on request, but which do not give the all-night operation required for these ratings, will be given the rating of "E" on night-lighting equipment.

"X" RATING.—The rating of "X" will be given to airports having no night-lighting equipment, or which do not provide all-night operation of lighting equipment or which do not keep this equipment available for operation on request as hereinabove required.

Part III.—RATING OF AIRPORTS FOR SEAPLANES

BASIC REQUIREMENTS

SEC. 8. The minimum basic requirements for the rating of seaplane airports are as follows: The seaplane airport shall be situated on or directly connected with a body of water having a minimum depth of not less than 6 feet at any time, calm enough for operations in all ordinary weather, and sufficiently large to permit landing and taking-off of seaplanes and flying boats without hazard. By direct connection is meant a canal or other stream of water wide enough to allow taxiing of planes without difficulty and a distance of not over one-quarter of a mile from the actual airport to the open water.

The airport shall be situated on a good road leading to the nearest city or town. It shall be equipped with an approved type of wind-direction indicator, as hereinabove specified, and shall be marked either on hangar roof or other suitable area, or on land immediately adjacent to the water, with the name of the city or town in the manner required under section 4 (*e*).

The airport shall be provided with facilities for supplying aircraft with fuel, oil, and water; also drinking water shall be available. If there are no rest rooms on the airport, a suitable latrine shall be provided. The airport shall have dependable communication and transportation facilities to the nearest city or town. Airport personnel shall be in attendance by day or available on call by telephone at the airport. In the latter case, a directory and full instructions for reaching such personnel shall be available in the telephone booth or receptacle.

RATING ON GENERAL EQUIPMENT AND FACILITIES

SEC. 9. "A" RATING.—In addition to the facilities named in the basic requirements, seaplane airports rated "A" on general equipment shall have the following:

(*a*) At least one hangar measuring not less than 80 by 120 feet in the clear inside with doors open, with 22-foot overhead clearance, with full-width door opening in either one or both ends or

one or both sides, and with safe provision for heating water and oil. In localities where freezing temperatures are experienced the hangar shall be heated sufficiently to prevent freezing of water.

(*b*) Wind-direction indicator as required for an "A" rating for landplane airports.

(*c*) Day marking of telephone and transmission line poles and similar obstructions in the immediate vicinity of the landing area as required for an "A" rating for landplane airports.

(*d*) Repair equipment sufficient to permit changing engines, pontoons, and amphibian landing gear in addition to equipment for major engine, plane, and hull repairs.

(*e*) Means for hauling planes out of the water. This will require either a marine railway or a suitable ramp. Dollies, cradles, or other apparatus suitable for carrying seaplanes and flying boats from the water into the hangar will be necessary, as well as power for hauling out cradles when loaded, such as a small tractor, a motor truck, or a winch.

(*f*) A boat capable of at least 10 knots speed for towing disabled planes to the airport and for use as a tender and rescue boat.

(*g*) Weather instruments as required for an "A" rating for landplane airports.

(*h*) Radio-receiving set and loud-speaker, under certain conditions, as required for an "A" rating for landplane airports.

(*i*) First-aid equipment as required for an "A" rating for landplane airports.

(*j*) Register as required for an "A" rating for landplane airports.

(*k*) Mooring facilities properly placed offshore for flying boats or seaplanes.

(*l*) Adequate fire-fighting apparatus as required for an "A" rating for landplane airports.

(*m*) Airport personnel as required for an "A" rating for landplane airports.

(*n*) Sleeping quarters for at least three men, in addition to station personnel, as required for an "A" rating for landplane airports.

(*o*) Waiting and rest rooms at or near the hangar.

(*p*) Restaurant or other source of food supply as required for an "A" rating for landplane airports.

"B" RATING.—In addition to the facilities named in the basic requirements, seaplane airports rated "B" on general equipment shall have the following:

(*a*) At least one hangar measuring not less than 80 by 100 feet in the clear inside with doors open, with 18-foot overhead clearance, with full-width door opening in either one or both ends or one or both sides, and with safe provisions for heating water and oil.

(*b*) Wind-direction indicator as required for an "A" rating for landplane airports.

(*c*) Day marking of telephone and transmission line poles and similar obstructions in the immediate vicinity of the landing area as required for an "A" rating for landplane airports.

(*d*) Repair equipment sufficient to permit changing engines and pontoons and amphibian landing gear, in addition to equipment for minor engine, plane, and hull repairs.

(*e*) Means for hauling planes out of the water such as required for an "A" rating for seaplane airports.

(*f*) A boat capable of at least 8 knots speed to act as tender, rescue boat, etc.

(*g*) Weather instruments as required for an "A" rating for landplane airports.

(*h*) First-aid equipment as required for an "A" rating for landplane airports.

(*i*) Register as required for an "A" rating for landplane airports.

(*j*) Mooring facilities as required for an "A" rating for seaplane airports.

(*k*) Adequate fire-fighting apparatus as required for an "A" rating for landplane airports.

(*l*) Airport personnel as required for a "B" rating for landplane airports.

(*m*) Sleeping quarters for at least two men, in addition to station personnel, as required for a "B" rating for landplane airports.

(*n*) Rest room at or near hangar.

"C" RATING.—In addition to the facilities named in the basic requirements, seaplane airports rated "C" on general equipment shall have the following:

(*a*) At least one hangar measuring not less than 50 by 60 feet in the clear inside with doors open, with 16-foot overhead clearance and with full-width door opening in either one or both ends or one or both sides, and with safe provisions for heating water and oil.

(*b*) Wind-direction indicator as required for a "C" rating for landplane airports.

(*c*) Suitable means for hauling planes out of the water, such as required for an "A" rating for seaplane airports.

(*d*) A boat capable of at least 8 knots speed for use as a tender, rescue boat, etc.

(*e*) First-aid equipment, fire-fighting equipment, and register as required for an "A" rating for landplane airports. (The day marking of telephone and transmission line poles and similar obstructions in the immediate vicinity of the landing area as required for the "A" and "B" ratings is not required for either the "C" or "D" ratings but is urgently recommended.)

(*f*) Rest room.

"D" RATING.—Seaplane airports which do not possess sufficient general equipment to obtain A, B, or C ratings, but which meet the basic requirements, will receive a rating of "D" on general equipment and facilities.

RATING ON SIZE OF EFFECTIVE LANDING AREA

SEC. 10. No seaplane airports will be rated unless they permit an unobstructed climb after taking off. The existence of reefs, shoals, sand bars, etc., within the areas described hereafter as "1," "2," "3," or "4" will eliminate consideration for rating unless, in the opinion of the Secretary of Commerce, marking and lighting of these dangerous obstructions eliminate all hazard. Such markers will, of course, have to conform to local and Federal harbor or river regulations both for day markers and night lights.

"1" RATING.—In addition to the basic requirements, seaplane airports receiving "1" rating on size of effective landing area shall

have clear approaches and be large enough to permit at least a 4,000-foot effective run in all directions.

"2" RATING.—In addition to the basic requirements, seaplane airports receiving a "2" rating on size of effective landing area shall have clear approaches and shall be large enough to permit at least a 3,500-foot effective run in all directions or shall have two landing courses, one aligned with the general direction of the prevailing wind, with clear approaches and permitting at least 4-way landing, the landing courses to be at least 600 feet wide and not less than 4,000 feet in effective length and not to cross or converge at an angle of less than 60°.

"3" RATING.—In addition to the basic requirements, seaplane airports receiving a "3" rating on size of effective landing area shall have clear approaches and shall be large enough to permit at least a 3,000-foot effective run in all directions, or shall have two landing courses, one aligned with the general direction of the prevailing wind, with clear approaches and permitting at least 4-way landing, the landing courses to be at least 600 feet wide and not less than 3,500 feet in effective length and not to cross or converge at an angle of less than 60°.

"4" RATING.—A seaplane airport which meets the basic requirements but which is not large enough to receive a "3" rating on size of landing area will be rated as "4" if, in the opinion of the Secretary of Commerce, it provides sufficient area for the use to which it is being put.

"0" RATING.—A seaplane airport which, in the opinion of the Secretary of Commerce, is unsafe for operation, but from which operations are nevertheless taking place and which requests a rating, will be rated "0" on size of effective landing area.

RATING ON NIGHT LIGHTING EQUIPMENT

SEC. 11. The matter of lighting seaplane airports is one to be treated as a separate problem in every case, as the possibility of interference with river, ocean, or harbor traffic makes general rules impossible. Flood lighting of the landing area is usually necessary, although the installation of boundary lights is ordinarily impracticable. Obstruction lights may be placed on obstacles if such lights do not conflict with local or Federal navigation laws and regulations. Lighting plans for seaplane airports shall be referred to the Department of Commerce, Washington, D. C., which department will determine whether there is any conflict between the proposed lighting system and the existing navigational aids for water craft, and whether the proposed system meets the special requirements for night lighting of such airports.

Subject to the foregoing statement, the requirements for the rating of seaplane airports on night-lighting equipment are as follows:

"A" RATING.—Seaplane airports receiving an "A" rating on night-lighting equipment shall have the following:

(*a*) An airport beacon as required for an "A" rating for landplane airports.

(*b*) An illuminated wind-direction indicator as required for an "A" rating for landplane airports.

(*c*) Suitable boundary lights (when practicable).
(*d*) Suitable obstruction lights.
(*e*) The exterior surface of hangars flood lighted and the name of the city or town marked on a hangar roof or other suitable surface, and illuminated, all as required for an "A" rating for landplane airports.
(*f*) Ceiling projector as required for an "A" rating for landplane airports.
(*g*) Landing area flood-light system as required for an "A" rating for landplane airports.
(*h*) All-night operation of lighting equipment as required for an "A" rating for landplane airports.
(*i*) Night personnel as required for an "A" rating for landplane airports.

"B" RATING.—Seaplane airports receiving a "B" rating on night-lighting equipment shall have the following:
(*a*) An airport beacon as required for an "A" rating for landplane airports.
(*b*) An illuminated wind-direction indicator as required for an "A" rating for landplane airports.
(*c*) Suitable boundary lights (when practicable).
(*d*) Suitable obstruction lights.
(*e*) The exterior surface of one hangar flood lighted and the name of the city or town marked on a hangar roof or other suitable surface, and illuminated, all as required for an "A" rating for landplane airports.
(*f*) A ceiling projector as required for an "A" rating for landplane airports.
(*g*) A landing area flood-light system as required for a "B" rating for landplane airports.
(*h*) All-night operation of lighting equipment as required for an "A" rating for landplane airports.
(*i*) Night personnel as required for a "B" rating for landplane airports.

"C" RATING.—Seaplane airports receiving a "C" rating on night-lighting equipment shall have the following:
(*a*) An airport beacon as required for an "A" rating for landplane airports.
(*b*) An illuminated wind-direction indicator as required for a "C" rating for landplane airports.
(*c*) Suitable boundary lights (when practicable).
(*d*) Suitable obstruction lights.
(*e*) A ceiling projector as required for an "A" rating for landplane airports.
(*f*) The name of the city or town marked on a hangar roof or other suitable surface, and illuminated, as required for an "A" rating for landplane airports.
(*g*) All-night operation of lighting equipment as required for an "A" rating for landplane airports.
(*h*) Attendance available on request.

"D" RATING.—Seaplane airports not possessing sufficient night-lighting equipment to receive a "C" rating but which possess either an airport beacon or boundary light system, or both, together with

an illuminated wind-direction indicator and suitable obstruction lights, will be given a rating of "D," providing all such lighting equipment is kept burning all night every night.

"E" RATING.—Airports having the necessary night-lighting equipment to meet the requirements of any of the above ratings and which keep this equipment available for operation on request, but which do not give the all-night operation required for these ratings, will be given the rating of "E" on night-lighting equipment.

"X" RATING.—The rating of "X" will be given all seaplane airports having no night-lighting equipment, or which do not provide all-night operation of lighting equipment or which do not keep this equipment available for operation on request as hereinabove required.

Part IV.—RATING OF COMBINED LANDPLANE AND SEAPLANE AIRPORTS

SEC. 12. Airports offering facilities for the operation of both landplanes and seaplanes will be given two separate and distinct ratings—first, as an airport for landplanes and, second, as an airport for seaplanes.

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